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TECHNICAL REPORT ON STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY, GENERAL WORKING POPULATION NORMS STUDY FOR PUERTO RICO.

BUREAU OF EMPLOYMENT SECURITY (DEPT. OF LABOR)
PUERTO RICO EMPLOYMENT SERVICE, SAN JUAN

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THE POSSIBILITY OF PREDICTIVE ERROR WHEN APPLYING U.S. MAINLAND NORMS FOR THE GENERAL APTITUDE TEST BATTERY TO THE EMPLOYMENT COUNSELING AND SELECTION PROCESS IN PUERTO RICO, PROMPTED A STUDY TO ESTABLISH LOCAL NORMS FOR THE SPANISH LANGUAGE VERSION, BATERIA GENERAL DE PRUEBAS DE APTITUD. A STRATIFIED QUOTA SAMPLE OF 1,500 PERSONS WAS SELECTED FROM THE PUERTO RICAN GENERAL WORKING POPULATION AFTER CONSIDERATION OF OCCUPATION, SEX, AGE, AND GEOGRAPHIC LOCATION. THE MAJOR DEPARTURE FROM RANDOM SELECTION WAS CAUSED BY SOME EMPLOYERS' REFUSAL TO FREE EMPLOYEES FOR TESTING. OCCUPATIONAL STRATIFICATION WAS BASED ON THE REVISED BUREAU OF THE CENSUS OCCUPATIONAL CLASSIFICATION SYSTEM. THE RATIO OF MALES TO FEMALES WAS 65 TO 35, THE USUAL AGE RANGE FROM 18 TO 45, AND NO PERSON WAS INCLUDED WHO HAD COMPLETED LESS THAN THE SIXTH GRADE. WHEN THE RESULTS WERE COMPARED WITH ASSUMED DISTRIBUTIONS HAVING THE MEAN OF ANY APTITUDE AS 100 AND THE STANDARD DEVIATION AS 20, ALL SCORES DEPARTED SIGNIFICANTLY FROM THIS BASE. EVERY APTITUDE EXCEPT MANUAL DEXTERITY WAS BELOW ITS STATEWIDE COUNTERPART AT OR BEYOND THE .01 LEVEL. MANUAL DEXTERITY WAS ABOVE ITS COUNTERPART AT THE .01 LEVEL. A CONVERSION TABLE GIVING PUERTO RICAN CUTTING SCORE EQUIVALENTS BASED ON PUERTO RICAN MEANS AND STANDARD DEVIATIONS IS INCLUDED. (EM)

United States Employment Service Technical Report December 1965

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Standardization of the General Aptitude Test Battery for PUERTO RICO

(General Working Population Norms Study)

For Administrative Use Only

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Technical Report
on
Standardization of the General Aptitude Test Battery
General Working Population Norm Study
For
Puerto Rico

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U.S. EMPLOYMENT SERVICE
in Cooperation with the
Puerto Rico Employment Service

December 1965

The Puerto Rican Standardization of the General Aptitude Test Battery (GATB)

I. Introduction

The General Aptitude Test Battery (B-1002, Form A) has been widely used in the Puerto Rico Agency, in its translated form, Bateria General de Pruebas de Aptitud (BGPA), since 1955.

While sometimes called an "adaptation", the test and the "Guide to the Use of the GATB" are only more - or - less colloquial translations. It is recognized that there are severe limitations to this state of affairs. As pointed out by the New York Office in its study which was completed in February 1963, with special reference to part 4 (verbal):

"Item construction is not parallel to the English test:

a) Parts of speech do not match up for 12 of 60 items.
b) Frequency and difficulty of the data did not play the same role in the construction of English and Spanish items."

Our project worked with the material at hand. Financial considerations made it impossible to undertake an adaptation.

It had long been felt that there was a very real possibility of predictive error in using the U.S. mainland norms in the counseling and selection process in Puerto Rico. Rather than following the original GATB standardization* point - for - point an attempt was made to reflect the actual work force distribution of the local population in the variables of occupation, sex, location, age and education. Any obtained differences cannot so easily be attributed to purely "cultural" factors, but what is lost in academic nicety is replaced by better meeting those practical necessities for which the instrument was initially developed. As a matter of fact, differences in the above dimensions are in themselves "cultural variants" important to note.

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* See Guide to the Use of the General Aptitude Test Battery, Section III, Development, October 1962; especially pages 17-26.

II. Methodology

Population

The base population for this standardization was calculated from the latest employment statistics compiled by the Commonwealth of Puerto Rico Department of Labor-Bureau of Labor Statistics: "Employment and Unemployment in Puerto Rico, October 1962". This presents revisions on the basis of the data from the 1960 Census of Population.

The level of total employment (persons 14 years and over) came to 601,000. For purposes of this tudy deletions were made, parallel to shrinkage in the original GATB standardization, that resulted in a base population of 343,000. Eliminated were the occupation categories including farmers, farm laborers, farm managers and foremen; all proprietors, managers and officials; and all service workers. In actuality, the U. S. normative population, while claiming to exclude "Proprietors, Managers and Officials" as classified by the Bureau of Census or Dictionary of Occupational Titles (D.O.T.) codes 0-7 through 0-9, included 27.6% of its professional sample in the base. In the Puerto Rico study, 10.1% fell within this classification range.

Table I shows the composition of the base population in terms of the Occupational groups established by the Bureau of the Census. These categories represent 57% of the working population. They represented 52% of the U. S. working population.

Table 1
Number and Percent of the 343,000
Base Population in Occupational Groups
Established by the Bureau of the Census

Occupational Group (2nd Edition D.O.T. Grouping)	Number (in thousands)	Percent of Base Population
Professional and Semi-Professional Workers (D.O.T. 0)	43	12.5
Clerical, Sales, and Kindred Workers (D.O.T. 1)	86	25.1
Craftsmen, Foremen and Kindred Workers (D.O.T. 4 + 5)	55	16.0
Operatives and Kindred Workers (D.O.T. 6 + 7)	112	32.7
Laborers, except Farm and Mine (D.O.T. 8 + 9)	47	13.7
Total.....	343	100.0

Note: The base population represents the 1962, October, employed labor force 14 years of age and over for selected occupational groups as established by the Bureau of the Census. Corresponding D.O.T. major occupational code groups are noted in parenthesis. D.O.T. 0 refers to 0-0 through 0-6.

Subsequent checks on the stability of the categories chosen were made in December 1962, March 1963 and October 1963. The proportions of workers in various occupational groups as well as the sex splits for those groups remained substantially unchanged.

Sample

The Puerto Rican General Working Population Sample was composed of 1,500 Puerto Ricans currently employed in one of the selected occupational groups. This figure represents 4.4 in 1,000 members of the base labor force as compared to the original GATB study which had 1.6 in 10,000. The term "Puerto Ricans" refers both to parentage and to initial upbringing on the island as established by interview.

The mean age of the standard sample was 30.9 with a standard deviation of 9.1. This compares with 30.4 and 9.9 respectively in the mainland study. "Age" was defined as "last completed birthday."

The mean educational level was 11.3 with a standard deviation of 3.0. The corresponding mainland figures were 11.0 and 2.6.

Sampling Design

The stratified quota method of sampling was adhered to as closely as possible in line with the dictates of the GATB standardization. Splits representing actual labor market conditions rather than duplications of stateside percentages were used. Occupation, sex, age and geographic location were considered in selecting the sample. Every effort was made to include a wide and representative number of different occupations and different industrial and commercial settings. In addition, the governmental-nongovernmental dimension was controlled as a possilbe source of bias. It is sometimes claimed that the capabilities of those seeking government jobs are inferior to those in private enterprises. The sample allowed for no more than 16.9% of its composition to be drawn from government. This was the October 1962 percentage of the labor force receiving Insular pay. 15.7% of the GATB normative group was selected from thirteen (13) governmental agencies.

The major departure from a truly random selection was caused by the necessity to obtain company approval for the testing of a group of employees, usually ten, for three hours during working time. It may be that employees who work for "cooperative" companies are in some sense "unlike" those who are employed by "uncooperative" firms. However, 131 different private business establishments representing every major sector of the economy lent their workers to the research project. No important job source within the occupational groupings used was left unrepresented.

Occupation

Occupational stratification was based on the revised Bureau of the Census occupational classification system. Within each selected occupational group, apportionment was made to assure a broad representation of specific occupations without ignoring the heavy loading of certain job types of particular importance and frequency in our economy.

In order to keep definitions clear, jobs were classified by the D.O.T. at each participating plant. To qualify for the study, an individual had to have worked in his current classification for at least one year, although not necessarily for the particular company in which presently employed. This arbitrary cut off point helps insure that the people tested have had time to use skills in their given classification. For professional groups, the same criterion held. No students were included. This is a "cheap" source of subjects but not a particularly meaningful one. (In the original study 28.4% of the professionals were students of unspecified academic grade).

Work Efficiency: as a further check, Plant Managers or Supervisors were asked to select a cross-section of their employees on the basis of production records such that the group tested would be composed of: "neither all the best nor all the worst workers but some from all levels."

Prior Exposure: No individual taking the GATB could have previously taken the whole battery or any of its subtests.

Sex

The original GATB standardization was grounded on a sex-split of 46-54% in favor of females. This partially reflected wartime conditions. For the occupational classifications included, the Puerto Rico ratio would be predominantly male 68-32%. The heavy emphasis on males being the breadwinners is a cultural phenomenon beginning to weaken but likely to last for a good many years. It seemed wise, therefore, to base the sample on actual rather than stateside distributions. The split used of 65-35% allows for some shift toward increasing use of women in clerical and industrial jobs. The method of changing the ratio was to weight the cases to be reassigned in accordance with frequency of occurance of male and female jobs in the varying categories. Table 2 shows the distribution by classification and sex.

Table 2

Number (Total, Male, Female) and Percent of the Puerto Rican Working Population Sample in Selected Occupational Groups

Occupational Group	Percent	Number		
		Total	Male	Female
Professional & Semiprofessional Workers (D.O.T. 0, mainly 0-0, 0-6)	12.50	188	96	92
Clerical, Sales & Kindred Workers (D.O.T. 1)	25.10	376	207	169
Craftsmen, Foremen & Kindred Workers (D.O.T. 4 + 5)	16.00	240	225	15
Operatives & Kindred Workers (D.O.T. 6 + 7)	32.70	491	246	245
Laborers, Except Farm & Mine (D.O.T. 8 + 9)	13.70	205	197	8
Total	100.00	1,500	971	529

The within group ratios were determined by reference to actual loadings in those occupational categories. Specific ratios were taken from Section III of the Guide. However, there had not been a material shift in the year preceeding and the year succeeding the sample selection.

Table three compares sex differences in sample composition of the U. S. and Puerto Rico standardization groups.

Table 3
Percentages of Males and Females in Occupational Categories of the General Working Class sample United States and Puerto Rico

	U.S.		P.R.	
	Male	Female	Male	Female
Professional & Semiprofessional	90	10	51	49
Clerical, Sales & Kindred	34	66	55	45
Craftmen, Foremen & Kindred	93	7	94	6
Operatives & Kindred	24	76	50	50
Laborers, except Farm & Mine	17	83	96	4
Overall Percentage	46	54	65	35

Age

The GATB is mostly used with individuals in the 18-54 age range. Of our sample, only 32 cases (2.13%) fell outside this range. This compares favorably with the age range original studies(3.50% outside these limits).

Education

The only limitation placed on education was not to accept any emplcyee who had completed less than sixth grade. The GATB is exceedingly difficult, below this level of formal training.

Geographic Distribution

Although considerable homogeneity of performance could be expected from a small island, an attempt was made to provide a reasonably accurate regional distribution. This was done by dividing the sample among the ten offices of the Puerto Rico Employment Service. These placement centers are located in towns but represent a wide outlying area. Between them the whole island is covered. The division was accomplished by weighting the placements made by each office in each occupational grouping relative to the placements in that grouping by all other offices. This gives each office's degree of comparative activity in each salient category. To achieve some stability figures used covered a period of a year and 3/4. That is 1961-1962 and the first 3/4 of 1962-1963.* Local Offices then had a quota to fill from their area based on past performance in placements in various occupational groups and the male-female ratios in those jobs and in those areas.

Regions are as follows:

Eastern	North Eastern	North Central	North West
Humacao	San Juan San Juan Professional Bayamón	Arecibo	Aguadilla

Eastern Central	South Eastern	Western Central	South Western
Caguas	Guayama	Mayaguez	Ponce

* Source: U. S. Department of Labor, Bureau of Employment Security Form ES-212 Nonagricultural Placements.

Testing Conditions

All workers were selected after a discussion with the Office Manager, Plant Manager and/or immediate supervisors. It was made clear to these officials that results would not be shown to them but would be used only to obtain better norms. In unionized establishments, the shop steward or union chief was consulted.

A standard circular "Aviso a los Trabajadores" was distributed to participants followed on the day of testing by an introductory talk along the same lines, in order to reduce suspicion and fears that the process would be prejudicial to the occupational permanency of the examinee. Points particularly emphasized were that the worker was chosen because he was capable, that the Employment Service wanted to base future norms on his showing. Also, that results would be confidential.

Employees were tested on company premises and on company time. Isolated rooms were found with adequate table space, lighting and ventilation. Many clerical and sales personnel were seen in local offices in order to obtain groups large enough to merit testing. Group size varied from four to twelve; the usual number being ten. Group composition in any given sitting could be heterogenous.

Testing procedure was identical to that during the usual full battery administrations save for the introductory talk.

III. Results

The results are shown in Tables 4 & 5 below.

Table 4
Means and Standard Deviations(SD) for the Puerto Rican General Working Population Sample. N = 1,500

Aptitude	Mean	SD
G	82.5	17.0
V	88.2	17.0
N	80.1	19.7
S	82.9	18.1
P	78.9	22.2
Q	88.4	18.2
K	95.9	20.9
F	93.4	21.5
M	102.1	21.8
Age	30.9	9.1
Education	11.3	3.0

Table 5
Conversion Table of Possible OAP Values
and SATB Values into their Puerto Rican Equivalents

U.S. Cutting Score	P. R. Cutting Score Equivalents								
	G	V	N	S	P	Q	K	F	M
130	108	114	110	110	112	116	127	126	135
125	104	109	105	105	107	111	122	120	129
120	99	105	100	101	101	107	117	115	124
115	95	101	95	96	96	102	112	109	118
110	91	97	90	92	90	98	106	104	113
105	87	92	85	87	84	93	101	99	108
100	82	88	80	83	79	88	96	93	102
95	78	84	75	78	73	84	91	88	97
90	74	80	70	74	68	79	86	83	91
85	70	75	65	69	62	75	80	77	86
80	65	71	60	65	57	70	75	72	80
75	61	67	55	60	51	66	70	67	75
70	57	63	51	56	46	61	65	61	69
65	52	58	46	51	40	56	59	56	64
60	48	54	41	47	34	52	54	51	58

IV. Discussion

If the results obtained in Table 4 are compared with assumed distributions in which the mean of any aptitude is defined as 100 and the standard deviation as 20, then all the scores depart significantly from this base. Every aptitude except M is below its stateside conterpart at or beyond the .01 level. M is above the U.S. manual dexterity distribution at the .01 level.

These differences cannot be attributed to variation in the age compositions of the samples. The slight difference reaches significance at the .05 level but developmental curves of aptitude increment and decrement do not show sharp changes between such congruent ages in that segment of the curve.

The differences cannot be attributed to variation in years of education inasmuch as the small but significant (.01 level) departure is in the opposite direction. The relative quality of those years of education was not under control.

If divergence could be explained by the distinct sex composition of the sample it is certainly not in the direction Section III of the Guide (pages 157-158) would predict. In the results reported there, men score higher on Spatial Aptitude and lower on clerical perception than do women. Our predominantly male sample scored considerably higher on clerical than on spatial but considerably lower in both than the original GATB general working population.

Several variables probably account for the differences: item construction, particularly for aptitude V is deficient; the test-taking attitudes, especially familiarity with tests could be different; the orientation toward speed could be a factor. It would make an interesting cross-cultural study to see if score differences could be attributed to differences in the speed of response. At the moment there is no way of isolating reasons for the divergence. For the practical purposes of the Employment Service there is no necessity to do so.

The conversion table, Table 5, shows the equivalent Puerto Rico cutting scores for various Occupational Aptitude Pattern (OAP) cutting scores.* If SATB and OAP cut off points are derived from distances from a mean of 100 with a deviation of 20, then any possible cutting score can be translated into equivalent distances from the Puerto Rican aptitude means for each aptitude, using the Puerto Rican standard deviation or fractions thereof, as the yardstick for departure.

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* See Guide to the Use of the General Aptitude Test Battery, Section II, Norms, January 1962.